



Analytical Laboratory

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Order Summary Report

Order Number: J13110076

Project Name: WWTS FGD-Routine 2013

Customer Name(s): Bill K, Wayne C, and Melonie M

Customer Address: 3195 Pine Hall Rd
Mailcode: Belews Steam Station
Belews Creek, NC 28012

Lab Contact: Jason C Perkins Phone: 980-875-5348

Report Authorized By: _____ **Date:** 11/25/2013
(Signature) Jason C Perkins

Program Comments:

Please contact the Program Manager (Jason C Perkins) with any questions regarding this report.

Data Flags & Calculations:

Any analytical tests or individual analytes within a test flagged with a Qualifier indicate a deviation from the method quality system or quality control requirement. The qualifier description is found at the end of the Certificate of Analysis (sample results) under the qualifiers heading. All results are reported on a dry weight basis unless otherwise noted. Subcontracted data included on the Duke Certificate of Analysis is to be used as information only. Certified vendor results can be found in the subcontracted lab final report. Duke Energy Analytical Laboratory subcontracts analyses to other vendor laboratories that have been qualified by Duke Energy to perform these analyses except where noted.

Data Package:

This data package includes analytical results that are applicable only to the samples described in this narrative. An estimation of the uncertainty of measurement for the results in the report is available upon request. This report shall not be reproduced, except in full, without the written consent of the Analytical Laboratory. Please contact the Analytical laboratory with any questions. The order of individual sections within this report is as follows:

Job Summary Report, Sample Identification, Technical Validation of Data Package, Analytical Laboratory Certificate of Analysis, Analytical Laboratory QC Reports, Sub-contracted Laboratory Results, Customer Specific Data Sheets, Reports & Documentation, Customer Database Entries, Test Case Narratives, Chain of Custody (COC)

Certification:

The Analytical Laboratory holds the following State Certifications : North Carolina (DENR) Certificate #248, South Carolina (DHEC) Laboratory ID # 99005. Contact the Analytical Laboratory for definitive information about the certification status of specific methods.

Sample ID's & Descriptions:

Sample ID	Plant/Station	Collection Date and Time	Collected By	Sample Description
2013027039	BELEWS	04-Nov-13 7:30 AM	TO	FGD Purge Eff
2013027040	BELEWS	04-Nov-13 7:35 AM	TO	EQ Tank Eff
2013027041	BELEWS	04-Nov-13 7:45 AM	TO	BioReactor 1 Inf
2013027042	BELEWS	04-Nov-13 7:55 AM	TO	BioReactor 2 Inf
2013027043	BELEWS	04-Nov-13 8:00 AM	TO	BioReactor 2 Eff
2013027044	BELEWS	04-Nov-13 8:05 AM	TO	Filter Blk
2013027045	BELEWS	24-Oct-13 11:30 AM	D. Baker	TRIP BLANK
7 Total Samples				

Technical Validation Review

Checklist:

COC and .pdf report are in agreement with sample totals and analyses (compliance programs and procedures).

☒ Yes☐ No

All Results are less than the laboratory reporting limits.

☐ Yes☒ No

All laboratory QA/QC requirements are acceptable.

☒ Yes☐ No

Report Sections Included:

☒ Job Summary Report☒ Sample Identification☒ Technical Validation of Data Package☒ Analytical Laboratory Certificate of Analysis☐ Analytical Laboratory QC Report☒ Sub-contracted Laboratory Results☐ Customer Specific Data Sheets, Reports, & Documentation☐ Customer Database Entries☒ Chain of Custody☒ Electronic Data Deliverable (EDD) Sent Separatel

Reviewed By: DBA Account

Date: 11/25/2013

Certificate of Laboratory Analysis

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*This report shall not be reproduced, except in full.***Order # J13110076**

Site: FGD Purge Eff

Collection Date: 04-Nov-13 7:30 AM

Sample #: 2013027039

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>NITRITE + NITRATE (COLORIMETRIC)</u>								
Nitrite + Nitrate (Colorimetric)	2.3	mg-N/L		0.05	5	EPA 353.2	11/15/2013 11:30	BGN9034
<u>INORGANIC IONS BY IC</u>								
Bromide	190	mg/L		5	50	EPA 300.0	11/11/2013 19:10	JAHERMA
<u>MERCURY (COLD VAPOR) IN WATER</u>								
Mercury (Hg)	359	ug/L		5	100	EPA 245.1	11/07/2013 17:13	DKJOHN2
<u>TOTAL RECOVERABLE METALS BY ICP</u>								
Boron (B)	188	mg/L		0.5	10	EPA 200.7	11/13/2013 12:01	MHH7131
<u>DISSOLVED METALS BY ICP-MS</u>								
Selenium (Se)	204	ug/L		10	10	EPA 200.8	11/20/2013 13:33	DJSULL1
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>								
Arsenic (As)	291	ug/L		10	10	EPA 200.8	11/18/2013 14:27	DJSULL1
Cadmium (Cd)	< 10	ug/L		10	10	EPA 200.8	11/18/2013 14:27	DJSULL1
Chromium (Cr)	551	ug/L		10	10	EPA 200.8	11/18/2013 14:27	DJSULL1
Copper (Cu)	215	ug/L		10	10	EPA 200.8	11/18/2013 14:27	DJSULL1
Nickel (Ni)	309	ug/L		10	10	EPA 200.8	11/18/2013 14:27	DJSULL1
Selenium (Se)	6510	ug/L		20	20	EPA 200.8	11/18/2013 14:27	DJSULL1
Silver (Ag)	< 10	ug/L		10	10	EPA 200.8	11/18/2013 14:27	DJSULL1
Zinc (Zn)	403	ug/L		10	10	EPA 200.8	11/18/2013 14:27	DJSULL1
<u>SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)</u>								
Vendor Parameter	Complete					Vendor Method		V_AS&C

Site: EQ Tank Eff

Collection Date: 04-Nov-13 7:35 AM

Sample #: 2013027040

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>MERCURY (COLD VAPOR) IN WATER</u>								
Mercury (Hg)	154	ug/L		2.5	50	EPA 245.1	11/07/2013 17:15	DKJOHN2
<u>TOTAL RECOVERABLE METALS BY ICP</u>								
Boron (B)	196	mg/L		0.5	10	EPA 200.7	11/13/2013 12:05	MHH7131
<u>DISSOLVED METALS BY ICP-MS</u>								
Selenium (Se)	88.3	ug/L		10	10	EPA 200.8	11/20/2013 13:41	DJSULL1

Certificate of Laboratory Analysis

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*This report shall not be reproduced, except in full.***Order # J13110076**

Site: EQ Tank Eff

Collection Date: 04-Nov-13 7:35 AM

Sample #: 2013027040

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>								
Arsenic (As)	144	ug/L		10	10	EPA 200.8	11/18/2013 14:30	DJSULL1
Cadmium (Cd)	< 10	ug/L		10	10	EPA 200.8	11/18/2013 14:30	DJSULL1
Chromium (Cr)	263	ug/L		10	10	EPA 200.8	11/18/2013 14:30	DJSULL1
Copper (Cu)	108	ug/L		10	10	EPA 200.8	11/18/2013 14:30	DJSULL1
Nickel (Ni)	213	ug/L		10	10	EPA 200.8	11/18/2013 14:30	DJSULL1
Selenium (Se)	3200	ug/L		10	10	EPA 200.8	11/18/2013 14:30	DJSULL1
Silver (Ag)	< 10	ug/L		10	10	EPA 200.8	11/18/2013 14:30	DJSULL1
Zinc (Zn)	220	ug/L		10	10	EPA 200.8	11/18/2013 14:30	DJSULL1

Site: BioReactor 1 Inf

Collection Date: 04-Nov-13 7:45 AM

Sample #: 2013027041

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>NITRITE + NITRATE (COLORIMETRIC)</u>								
Nitrite + Nitrate (Colorimetric)	3.4	mg-N/L		0.05	5	EPA 353.2	11/15/2013 11:31	BGN9034
<u>Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)</u>								
Vendor Parameter	Complete	ug/l				Vendor Method		V_AS&C
<u>TOTAL RECOVERABLE METALS BY ICP</u>								
Boron (B)	199	mg/L		0.5	10	EPA 200.7	11/13/2013 12:09	MHH7131
<u>DISSOLVED METALS BY ICP-MS</u>								
Selenium (Se)	< 10	ug/L		10	10	EPA 200.8	11/20/2013 13:45	DJSULL1
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>								
Arsenic (As)	< 10	ug/L		10	10	EPA 200.8	11/18/2013 15:06	DJSULL1
Cadmium (Cd)	< 10	ug/L		10	10	EPA 200.8	11/18/2013 15:06	DJSULL1
Chromium (Cr)	< 10	ug/L		10	10	EPA 200.8	11/18/2013 15:06	DJSULL1
Copper (Cu)	< 10	ug/L		10	10	EPA 200.8	11/18/2013 15:06	DJSULL1
Nickel (Ni)	43.0	ug/L		10	10	EPA 200.8	11/18/2013 15:06	DJSULL1
Selenium (Se)	68.9	ug/L		10	10	EPA 200.8	11/18/2013 15:06	DJSULL1
Silver (Ag)	< 10	ug/L		10	10	EPA 200.8	11/18/2013 15:06	DJSULL1
Zinc (Zn)	< 10	ug/L		10	10	EPA 200.8	11/18/2013 15:06	DJSULL1
<u>SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)</u>								
Vendor Parameter	Complete					Vendor Method		V_AS&C

Certificate of Laboratory Analysis

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*This report shall not be reproduced, except in full.***Order # J13110076**

Site: BioReactor 2 Inf

Collection Date: 04-Nov-13 7:55 AM

Sample #: 2013027042

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)</u>								
Vendor Parameter	Complete	ug/l				Vendor Method		V_AS&C
<u>TOTAL RECOVERABLE METALS BY ICP</u>								
Boron (B)	195	mg/L		0.5	10	EPA 200.7	11/13/2013 12:13	MHH7131
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>								
Arsenic (As)	< 10	ug/L		10	10	EPA 200.8	11/18/2013 14:42	DJSULL1
Cadmium (Cd)	< 10	ug/L		10	10	EPA 200.8	11/18/2013 14:42	DJSULL1
Chromium (Cr)	< 10	ug/L		10	10	EPA 200.8	11/18/2013 14:42	DJSULL1
Copper (Cu)	< 10	ug/L		10	10	EPA 200.8	11/18/2013 14:42	DJSULL1
Nickel (Ni)	< 10	ug/L		10	10	EPA 200.8	11/18/2013 14:42	DJSULL1
Selenium (Se)	< 10	ug/L		10	10	EPA 200.8	11/18/2013 14:42	DJSULL1
Silver (Ag)	< 10	ug/L		10	10	EPA 200.8	11/18/2013 14:42	DJSULL1
Zinc (Zn)	< 10	ug/L		10	10	EPA 200.8	11/18/2013 14:42	DJSULL1

Site: BioReactor 2 Eff

Collection Date: 04-Nov-13 8:00 AM

Sample #: 2013027043

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>NITRITE + NITRATE (COLORIMETRIC)</u>								
Nitrite + Nitrate (Colorimetric)	< 0.01	mg-N/L		0.01	1	EPA 353.2	11/15/2013 11:25	BGN9034
<u>INORGANIC IONS BY IC</u>								
Bromide	150	mg/L		5	50	EPA 300.0	11/11/2013 19:29	JAHERMA
<u>Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)</u>								
Vendor Parameter	Complete	ug/l				Vendor Method		V_AS&C
<u>TOTAL RECOVERABLE METALS BY ICP</u>								
Boron (B)	182	mg/L		0.5	10	EPA 200.7	11/13/2013 12:18	MHH7131
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>								
Arsenic (As)	< 5	ug/L		5	5	EPA 200.8	11/18/2013 15:09	DJSULL1
Cadmium (Cd)	< 5	ug/L		5	5	EPA 200.8	11/18/2013 15:09	DJSULL1
Chromium (Cr)	< 5	ug/L		5	5	EPA 200.8	11/18/2013 15:09	DJSULL1
Copper (Cu)	< 5	ug/L		5	5	EPA 200.8	11/18/2013 15:09	DJSULL1
Nickel (Ni)	< 5	ug/L		5	5	EPA 200.8	11/18/2013 15:09	DJSULL1
Selenium (Se)	< 5	ug/L		5	5	EPA 200.8	11/18/2013 15:09	DJSULL1
Silver (Ag)	< 5	ug/L		5	5	EPA 200.8	11/18/2013 15:09	DJSULL1
Zinc (Zn)	< 5	ug/L		5	5	EPA 200.8	11/18/2013 15:09	DJSULL1

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Site: BioReactor 2 Eff

Collection Date: 04-Nov-13 8:00 AM

Sample #: 2013027043

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)</u>								
Vendor Parameter	Complete					Vendor Method		V_AS&C
<u>TOTAL DISSOLVED SOLIDS</u>								
TDS	16000	mg/L		25	1	SM2540C	11/06/2013 16:37	TJA7067

Site: Filter Blk

Collection Date: 04-Nov-13 8:05 AM

Sample #: 2013027044

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>DISSOLVED METALS BY ICP-MS</u>								
Selenium (Se)	1.01	ug/L		1	1	EPA 200.8	11/20/2013 13:19	DJSULL1

Site: TRIP BLANK

Collection Date: 24-Oct-13 11:30 AM

Sample #: 2013027045

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>TOTAL RECOVERABLE METALS BY ICP</u>								
Boron (B)	< 0.05	mg/L		0.05	1	EPA 200.7	11/13/2013 11:37	MHH7131
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>								
Arsenic (As)	< 1	ug/L		1	1	EPA 200.8	11/18/2013 14:05	DJSULL1
Cadmium (Cd)	< 1	ug/L		1	1	EPA 200.8	11/18/2013 14:05	DJSULL1
Chromium (Cr)	< 1	ug/L		1	1	EPA 200.8	11/18/2013 14:05	DJSULL1
Copper (Cu)	< 1	ug/L		1	1	EPA 200.8	11/18/2013 14:05	DJSULL1
Nickel (Ni)	< 1	ug/L		1	1	EPA 200.8	11/18/2013 14:05	DJSULL1
Selenium (Se)	< 1	ug/L		1	1	EPA 200.8	11/18/2013 14:05	DJSULL1
Silver (Ag)	< 1	ug/L		1	1	EPA 200.8	11/18/2013 14:05	DJSULL1
Zinc (Zn)	< 1	ug/L		1	1	EPA 200.8	11/18/2013 14:05	DJSULL1



**APPLIED SPECIATION
AND CONSULTING, LLC**

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November 20, 2013

Jay Perkins
Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd.
Huntersville, NC 28078
(704) 875-5245

Project: Belews - FGD WWTS (Bi-Monthly & Flex Fuel & DSI) (LIMS# J13110076)

Mr. Perkins,

Attached is the report associated with four (4) aqueous samples submitted for total mercury and selenium speciation analysis on November 6, 2013. The samples were received in a sealed cooler at -0.1°C on November 7, 2013. Selenium speciation analysis was performed via ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS). Mercury quantitation was performed via cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS). Any issues associated with the analysis are addressed in the following report.

If you have any questions, please feel free to contact me at your convenience.

Sincerely,

A handwritten signature in black ink, appearing to read "Jeremy Maute".

Jeremy Maute
Project Coordinator
Applied Speciation and Consulting, LLC

Applied Speciation and Consulting, LLC

Report prepared for:

Jay Perkins
Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd.
Huntersville, NC 28078

Project: Belews - FGD WWTS (Bi-Monthly & Flex Fuel & DSI) (LIMS# J13110076)

November 20, 2013

1. Sample Reception

Four (4) aqueous samples were submitted for selenium speciation analysis on November 6, 2013. Three (3) additional samples were submitted for total mercury quantitation. All samples were received in acceptable condition on November 7, 2013 in a sealed container at -0.1°C.

All samples were received in a laminar flow clean hood, void of trace metals contamination and ultra-violet radiation, and were designated discrete sample identifiers. The 40mL borosilicate glass vials submitted for total mercury were preserved with bromine monochloride (BrCl) solution. The resulting samples were stored in a secure polyethylene container, known to be free from trace metals contamination, until the analyses could be performed.

An aliquot of each sample requiring selenium speciation evaluation was filtered (0.45µm) and each filtrate was stored in a secure, monitored cryofreezer (maintained at a temperature of -80°C) until selenium speciation analysis could be performed via ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS).

2. Sample Preparation

All sample preparation is performed in laminar flow clean hoods known to be free from trace metals contamination. All applied water for dilutions and sample preservatives are monitored for contamination to account for any biases associated with the sample results.

Total Mercury Quantitation by CV-ICP-MS All samples and preparation blanks for total mercury quantitation were preserved with 2% (v/v) BrCl. The resulting samples were analyzed for mercury via cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS).

Selenium Speciation Analysis by IC-ICP-CRC-MS Prior to analysis, an aliquot of each sample was filtered with a syringe filter (0.45 μ m) and injected directly into a sealed autosampler vial. No further sample preparation was performed as any chemical alteration of a sample may shift the equilibrium of the system, resulting in changes in speciation ratios.

3. Sample Analysis

All sample analysis is preceded by a minimum of a five-point calibration curve spanning the entire concentration range of interest. Calibration curves are performed at the beginning of each analytical day. All calibration curves, associated with each species of interest, are standardized by linear regression resulting in a response factor. All sample results are **instrument blank corrected** to account for any operational biases associated with the analytical platform.

Prior to sample analysis, all calibration curves are verified using second source standards which are identified as initial calibration verification standards (ICV).

Ongoing instrument performance is identified by the analysis of continuing calibration verification standards (CCV) and continuing calibration blanks (CCB) at a minimum interval of every ten analytical runs.

Total Mercury Quantitation by CV-ICP-MS The sample fractions for total mercury quantitation were analyzed by cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS) on November 18, 2013. Aliquots of each sample are reacted with a reductant in-line and transported to a gas-liquid separator. The volatile elemental mercury that is formed is then swept by a stream of argon gas into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and separated on the basis of their mass-to-charge ratio (m/z) by a mass spectrometer. A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Selenium Speciation Analysis by IC-ICP-CRC-MS Each sample for selenium speciation analysis was analyzed by ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS) on November 15, 2013. An aliquot of each sample is injected onto an anion exchange column and mobilized by a basic ($\text{pH} > 7$) gradient. The eluting selenium species are then introduced into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and travel through a pressurized chamber (CRC) containing a reaction gas which preferentially reacts with interfering ions of the same target mass to charge ratios (m/z). A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Retention times for each eluting species are compared to known standards for species identification.

4. Analytical Issues

The overall analyses went well and no significant analytical issues were encountered. All quality control parameters associated with these samples were within acceptance limits.

The estimated method detection limits (eMDLs) for selenite, selenate, and selenocyanate are generated from replicate analyses of the lowest standard in the calibration curve. Not all selenium species are present in preparation blanks; therefore, eMDL calculations based on preparation blanks are artificially biased low.

The eMDL for methylseleninic acid and selenomethionine is calculated from the average eMDL of selenite, selenate, and selenocyanate. The calibration does not contain methylseleninic acid or selenomethionine due to impurities in these standards which would bias the results for other selenium species.

The eMDL for mercury has been calculated using the standard deviation of the preparation blanks preserved and analyzed concurrently with the submitted samples.

If you have any questions or concerns regarding this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'J. Maute', with a stylized flourish at the end.

Jeremy Maute
Project Coordinator
Applied Speciation and Consulting, LLC

Total Mercury & Selenium Speciation Results for Duke Energy
 Project Name: Belews - FGD WWTS (Bi-Monthly & Flex Fuel & DSI)
 Contact: Jay Perkins
 LIMS #J13110076

Date: November 20, 2013
 Report Generated by: Jeremy Maute
 Applied Speciation and Consulting, LLC

Sample Results

Sample ID	Total Hg	Se(IV)	Se(VI)	SeCN	MeSe(IV)	SeMe	Unknown Se Species (n)
FGD Purge Eff	NR	105	39.2	ND (< 2.1)	3.6	ND (< 1.7)	0 (0)
BioReactor 1 Inf	0.0159	19.2	35.8	ND (< 0.53)	1.14	ND (< 0.43)	2.18 (1)
BioReactor 2 Inf	0.101	NR	NR	NR	NR	NR	NR
BioReactor 2 Eff	0.193	ND (< 0.47)	ND (< 0.30)	ND (< 0.53)	ND (< 0.43)	ND (< 0.43)	0 (0)

All results reflect the applied dilution and are reported in µg/L

NR = Analysis not requested

ND = Not detected at the applied dilution

SeCN = Selenocyanate

MeSe(IV) = Methylseleninic acid

SeMe = Selenomethionine

Unknown Se Species = Total concentration of all unknown Se species observed by IC-ICP-MS

n = number of unknown Se species observed

Total Mercury & Selenium Speciation Results for Duke Energy
 Project Name: Belews - FGD WWTS (Bi-Monthly & Flex Fuel & DSI)
 Contact: Jay Perkins
 LIMS #J13110076

Date: November 20, 2013
 Report Generated by: Jeremy Maute
 Applied Speciation and Consulting, LLC

Quality Control Summary - Preparation Blank Summary

Analyte (µg/L)	PBW1	PBW2	PBW3	PBW4	Mean	StdDev	eMDL*	eMDL 5x	eMDL 250x	eMDL 1000x
Hg	-0.0003	-0.0002	-0.0007	-0.0004	-0.0004	0.0002	0.0001	0.0006	-	-
Se(IV)	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-	0.47	1.9
Se(VI)	0.000	0.000	0.000	0.000	0.000	0.000	0.001	-	0.30	1.2
SeCN	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-	0.53	2.1
MeSe(IV)	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-	0.43	1.7
SeMe	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-	0.43	1.7

eMDL = Estimated Method Detection Limit

*Please see narrative regarding eMDL calculations

Quality Control Summary - Certified Reference Materials

Analyte (µg/L)	CRM	True Value	Result	Recovery
Hg	NIST 1641d	1568	1626	103.7
Se(IV)	LCS	9.57	9.28	96.9
Se(VI)	LCS	9.48	9.22	97.3
SeCN	LCS	8.92	8.55	95.9
MeSe(IV)	LCS	6.47	6.23	96.3
SeMe	LCS	9.32	8.84	94.8

Total Mercury & Selenium Speciation Results for Duke Energy
 Project Name: Belews - FGD WWTS (Bi-Monthly & Flex Fuel & DSI)
 Contact: Jay Perkins
 LIMS #J13110076

Date: November 20, 2013
 Report Generated by: Jeremy Maute
 Applied Speciation and Consulting, LLC

Quality Control Summary - Matrix Duplicates

Analyte (µg/L)	Sample ID	Rep 1	Rep 2	Mean	RPD
Hg	BioReactor 2 Eff	0.1934	0.1955	0.1945	1.1
Se(IV)	BioReactor 2 Eff	ND (< 0.47)	ND (< 0.47)	NC	NC
Se(VI)	BioReactor 2 Eff	ND (< 0.30)	ND (< 0.30)	NC	NC
SeCN	BioReactor 2 Eff	ND (< 0.53)	ND (< 0.53)	NC	NC
MeSe(IV)	BioReactor 2 Eff	ND (< 0.43)	ND (< 0.43)	NC	NC
SeMe	BioReactor 2 Eff	ND (< 0.43)	ND (< 0.43)	NC	NC


ND = Not detected at the applied dilution

NC = Value was not calculated due to one or more concentrations below the eMDL

Quality Control Summary - Matrix Spike/ Matrix Spike Duplicate

Analyte (µg/L)	Sample ID	Spike Conc	MS Result	Recovery	Spike Conc	MSD Result	Recovery	RPD
Hg	BioReactor 2 Eff	2.000	2.347	107.6	2.000	2.320	106.3	1.2
Se(IV)	BioReactor 2 Eff	1390	1312	94.4	1390	1315	94.6	0.2
Se(VI)	BioReactor 2 Eff	1261	1178	93.4	1261	1187	94.1	0.7
SeCN	BioReactor 2 Eff	1144	1054	92.2	1144	1060	92.6	0.5

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

		Duke Energy Analytical Laboratory Mail Code MGO3A2 (Building 7405) 13339 Hagers Ferry Rd Huntersville, N.C. 28078 (704) 875-5245 Fax: (704) 875-4349	
1) Project Name Belews - FGD		2) Phone No:	
2) Client: WWTS (Bi-Monthly & Flex Fuel & DSI)		Use Project: WWTS	
Bill Kennedy, Melonie Martin, Wayne Chapman		FGD-Routine 2013	
5) Business Unit: 20003	6) Process: BMCEFGD	9) Res. Type:	Mail Code:
8) Oper. Unit: BC00	10) Reso. Center:		

ORDER# 413110076		MATRIX: OTHER		Samples Originating From:	NC: SC:
Logged By: DM	Date & Time: 11/5/13 11:34	AS&C PO #650910		SAMPLE PROGRAM Water: RCRA Waste:	Ground NPDES Drinking Water UST:
15) Preserv. 1=HCL 2=H2SO4 3=HNO3 4=Ice 5=None		16) Cooler Temp (C) 10		17) Analyses Required	

LAB USE ONLY	11) Lab ID
•	201 302 2039
•	201 302 2040
•	201 302 2041
•	201 302 2042
•	201 302 2043
•	201 302 2044
•	201 302 2045

Se Speciation Bottle ID	13) Sample Description or ID
	FGD Purge Eff
	EQ Tank Eff.
	BioReactor 1 Inf
	BioReactor 2 Inf
	BioReactor 2 Eff
	Filter Blk
	Metals Trip Blk

Date	Time	Signature	17) Comp.	18) Grab	19) Analyses	20) TDS	21) Se (IMS), filtered	22) Hg 200.8 (V-AS&C)	23) NO3-NO2	24) 4, 3, 4, 3, 4, 2, 4	25) 4
11/4	0730	TO					1	1	1		
11/4	0735						1	1	1		
11/4	0745						1	1	1		
11/4	0755						1	1	1		
11/4	0800						1	1	1		
11/4	0805	TO					1	1	1		
10/24/13	11:30	D.B.C.					1	1	1		

Filtering of the Se is performed in the field please provide a filter blank too.

Return Kit to Travis Thornton @ Belews

1) Relinquished By: [Signature]		Date/Time: 11/4/13 13:40
3) Relinquished By: [Signature]		Date/Time: 11/5/13
5) Relinquished By: [Signature]		Date/Time: 11/7/13 1200 -01:00
7) Relinquished By:		Date/Time:
9) Seal/Locked By:		Date/Time:
11) Seal/Locked By:		Date/Time:
Comments:		

22) Requested Turnaround 21 Days *7 Days -48 Hr *Other *Add Cost Will Apply	Page 15 of 16
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* B by TRM/ICP As, Cd, Cr, Cu, Ni, Se, Ag, Zn by TRM/IMS 1**=No Hg

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

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Duke Energy Analytical Laboratory

Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd
Huntersville, N. C. 28078
(704) 875-5245
Fax: (704) 875-4349

Analytical Laboratory Use Only			
ORDER# 13114576	MATRIX: OTHER	Samples Originating From	NC SC
Logged By DM	Date & Time 11/5/13 113A	SAMPLE PROGRAM Water	Ground NPDES Drinking Water UST RCRA Waste
Cooler Temp (C)			

AS&C
PO #650910

¹⁹Page 1 of 2
DISTRIBUTION
ORIGINAL to LAB,
COPY to CLIENT

1) Project Name Belews - FGD WWTs (Bi-Monthly & Flex Fuel & DSI)		2) Phone No:
2) Client: Bill Kennedy, Melonie Martin, Wayne Chapman		Use Project: WWTs FGD-Routine 2013
5) Business Unit: 20003	6) Process: BMCEFGD	Mail Code:
8) Oper. Unit: BC00	9) Res. Type:	10) Reso. Center:

Customer to complete all
appropriate non-shaded areas.

Sampling conducted: 2nd and 4th Wednesday

LAB USE ONLY	
¹¹ Lab ID	
201	302 7039
201	302 7040
201	302 7041
201	302 7042
201	302 7043
201	302 7044
201	302 7045

Customer to complete appropriate columns to right

Se Speciation Bottle ID	¹³ Sample Description or ID	Date	Time	Signature	¹⁷ Comp.	¹⁸ Grab	TDS	Br (Dionex)	Metals* + Hg 245.1**	Se (IMS), filtered	NO3-NO2	Hg 200.8 (V_AS&C)	Se, speciation - vendor to AS&C (Important to place filled bottle back into both baggies)
	FGD Purge Eff	11/4	0730	TO				1	1	1	1		1
	EQ Tank Eff.	11/4	0735						1	1			1
	BioReactor 1 Inf	11/4	0745						1**	1	1	1	1
	BioReactor 2 Inf	11/4	0755						1**			1	
	BioReactor 2 Eff	11/4	0800				1	1	1**		1	1	1
	Filter Blk	11/4	0805	TO						1			
	Metals Trip Blk	10/24/13	1130	J. Bel					1**				

Filtering of the Se is performed in the field please provide a filter blank too.

Return Kit to Travis Thorton @ Belews

Customer to sign & date below - fill out from left to right.

1) Relinquished By 	Date/Time 11/4/13 13:40	2) Accepted By 	Date/Time 11/5/13 1125
3) Relinquished By	Date/Time	4) Accepted By	Date/Time
5) Relinquished By	Date/Time	6) Accepted By	Date/Time
7) Relinquished By	Date/Time	8) Accepted By	Date/Time
9) Seal/Locked By	Date/Time	10) Seal/Lock Opened By	Date/Time
11) Seal/Locked By	Date/Time	12) Seal/Lock Opened By	Date/Time
Comments			

* B by TRM/ICP As, Cd, Cr, Cu, Ni, Se, Ag, Zn by TRM/IMS 1**=No Hg

Customer, IMPORTANT!
Please indicate desired turnaround.

²²Requested Turnaround

21 Days _____

*7 Days _____

*48 Hr _____

*Other _____

* Add. Cost Will Apply